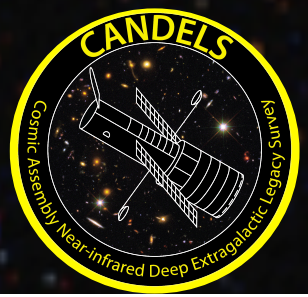
Morphological Bulge-Disk Galaxy Decompositions at 1<z<3

Victoria Bruce

University of Edinburgh





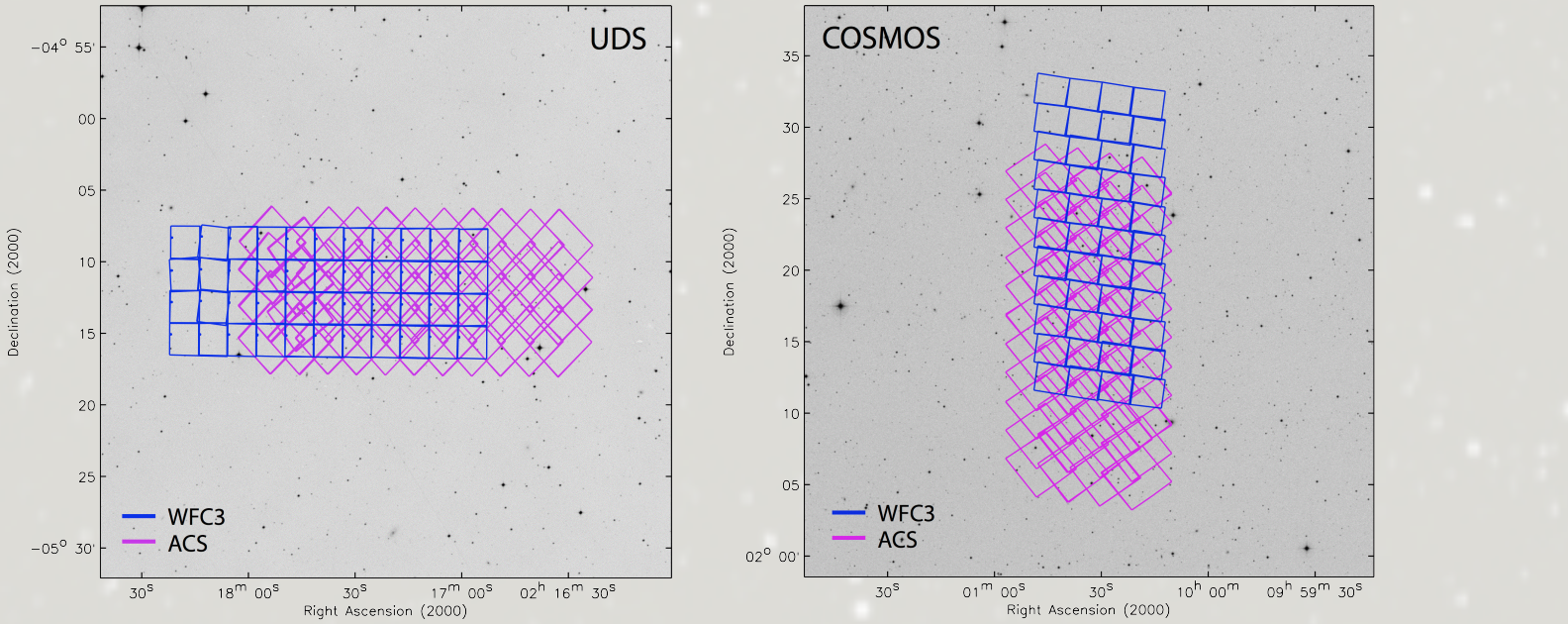




THE UNIVERSITY *of* EDINBURGH

Introduction

- How do galaxies evolve and how is star-formation quenched ? Is quenching linked to morphological transformations ?
- How can morphological bulge+disk decompositions help to answer these questions ?
- CANDELS:



Grogin et al. 2011

- Mass-selected, homogeneous sample of ~400 objects within $1<z_{phot}<3$ and with $M_{\star}>10^{11}M_{\odot}$ (Bruce et al. 2012 +COSMOS update)

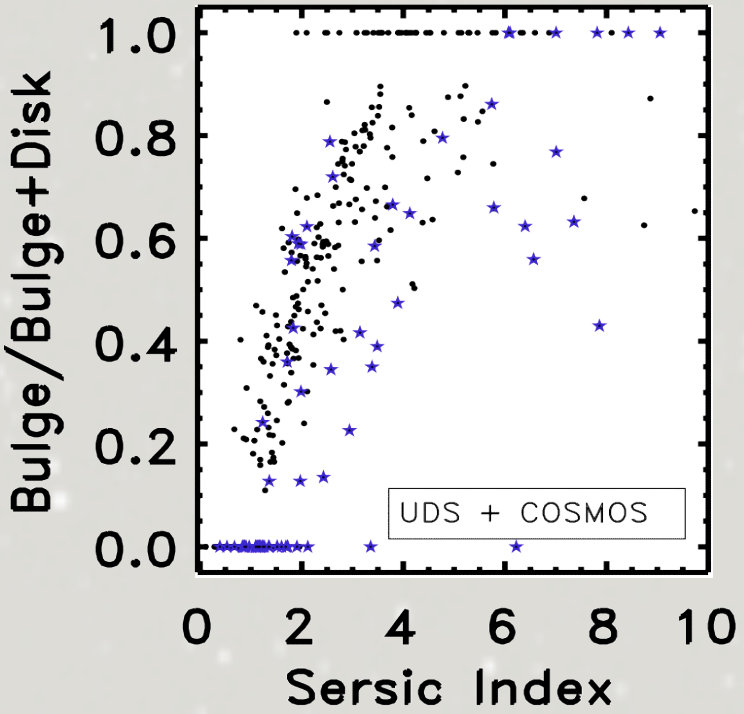
Bulge+Disk Decompositions

Define 3 components : disk n=1, bulge n=4, PSF

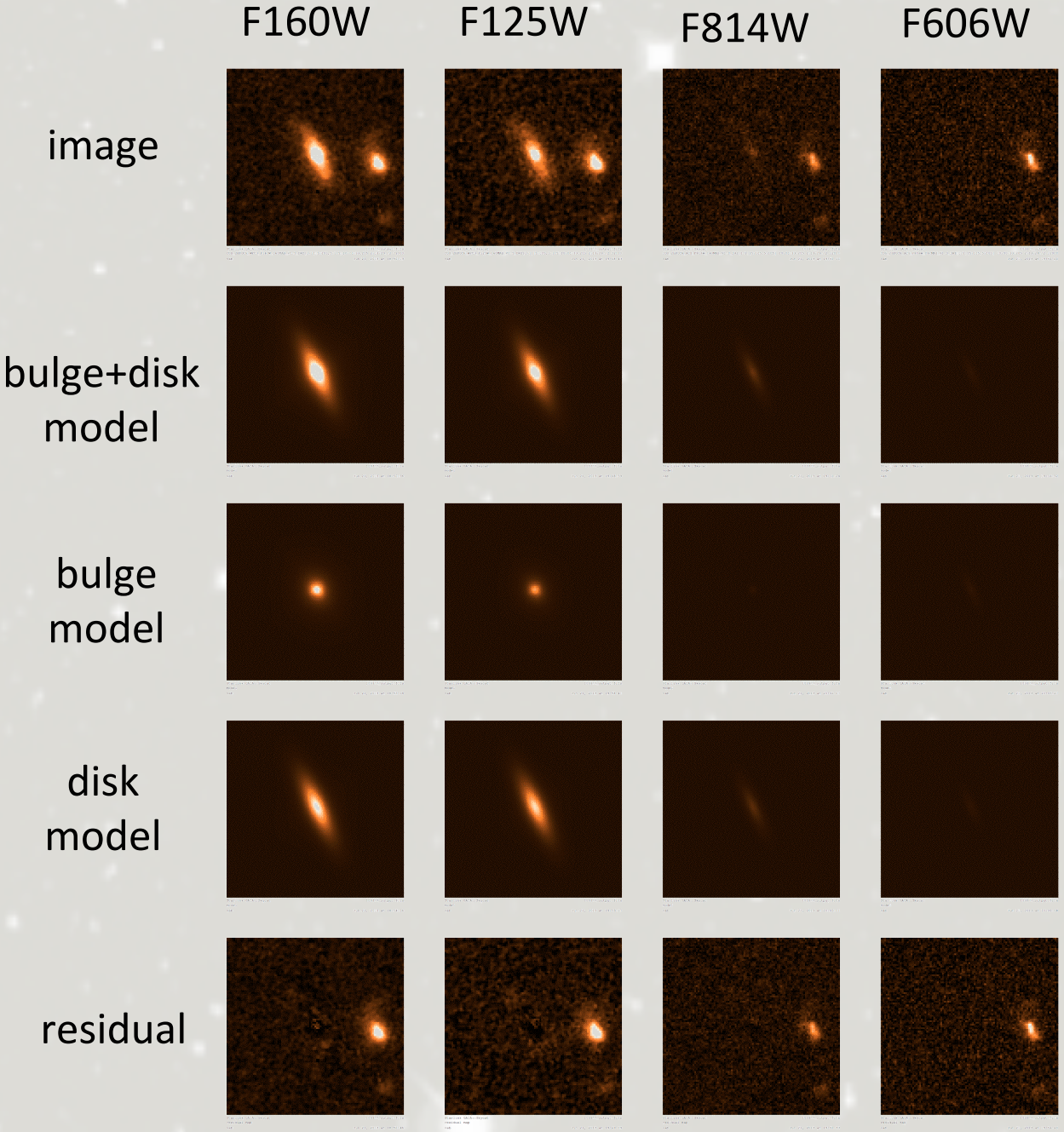
Models:

- bulge only
- disk only
- bulge + disk
- bulge + PSF
- disk + PSF
- bulge + disk + PSF

Relation between the bulge/bulge+disk light fraction and the single component model Sérsic index from the F160W decompositions.

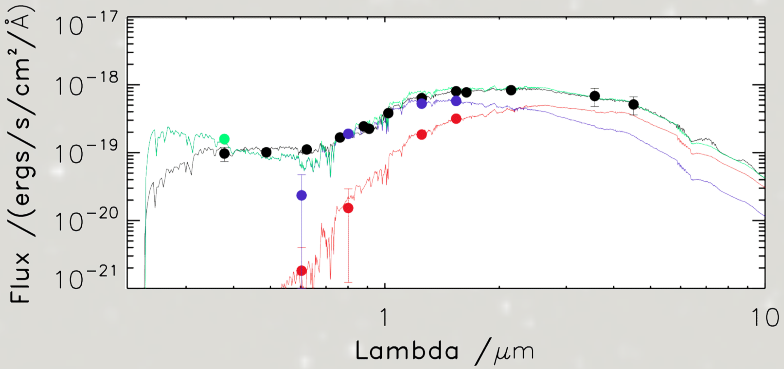


Example Morphological Decomposition

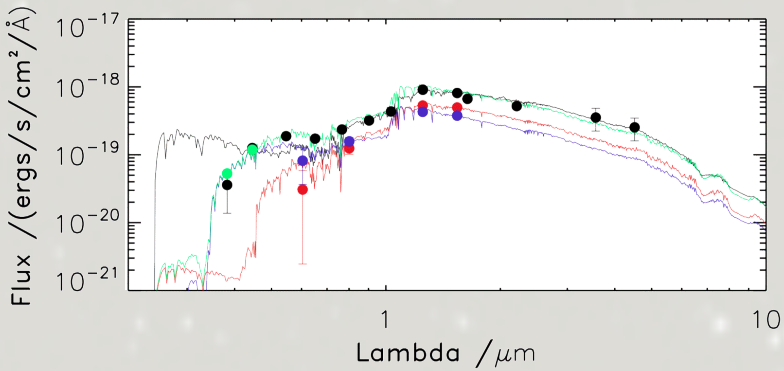


Example SED Fitting

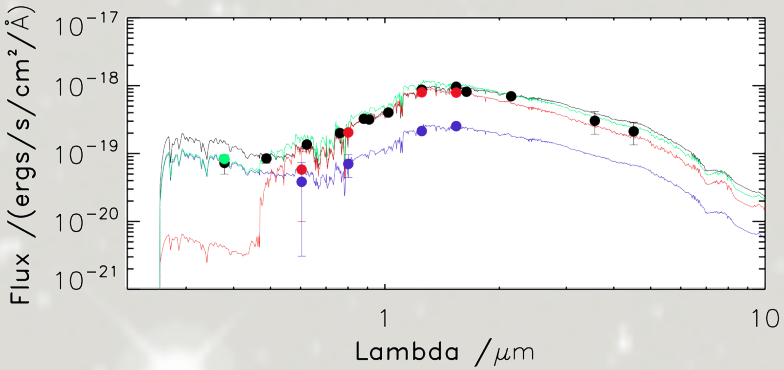
B/T<0.5



B/T=0.5



B/T>0.5



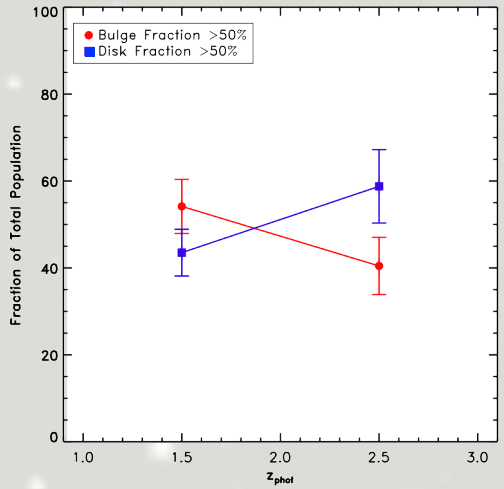
Evolution of Morphological Fractions

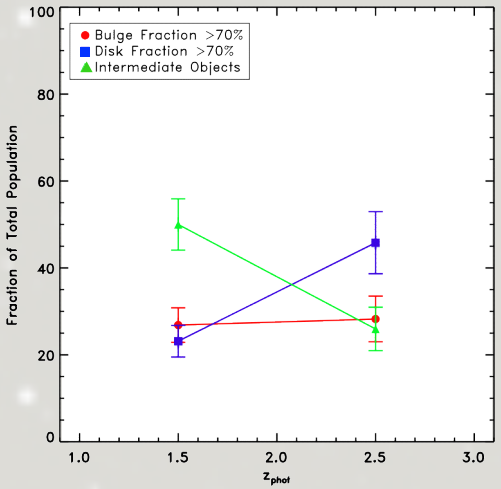
B/T>0.5
D/T>0.5

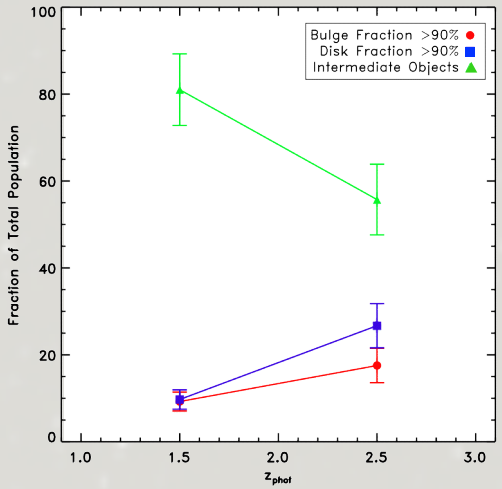
B/T>0.7
D/T>0.7

B/T>0.9
D/T>0.9

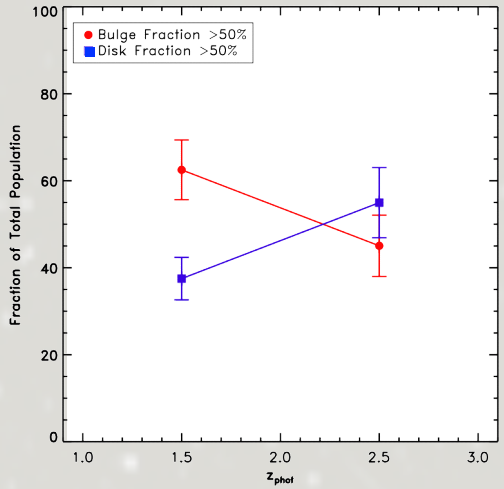
fractions by light

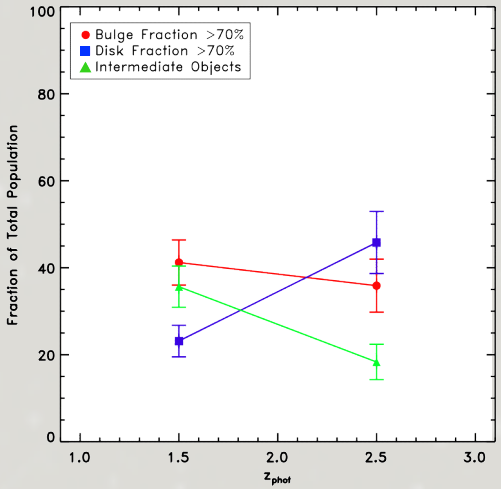


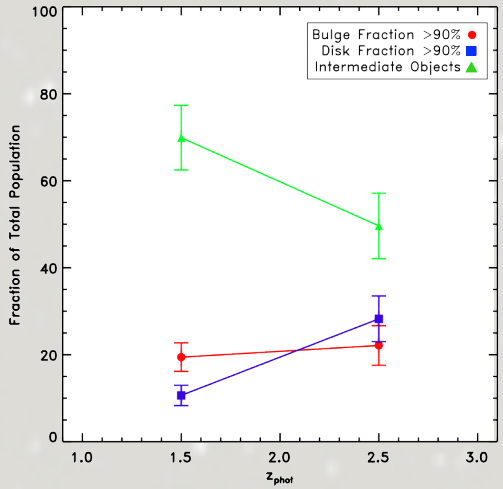




fractions by mass



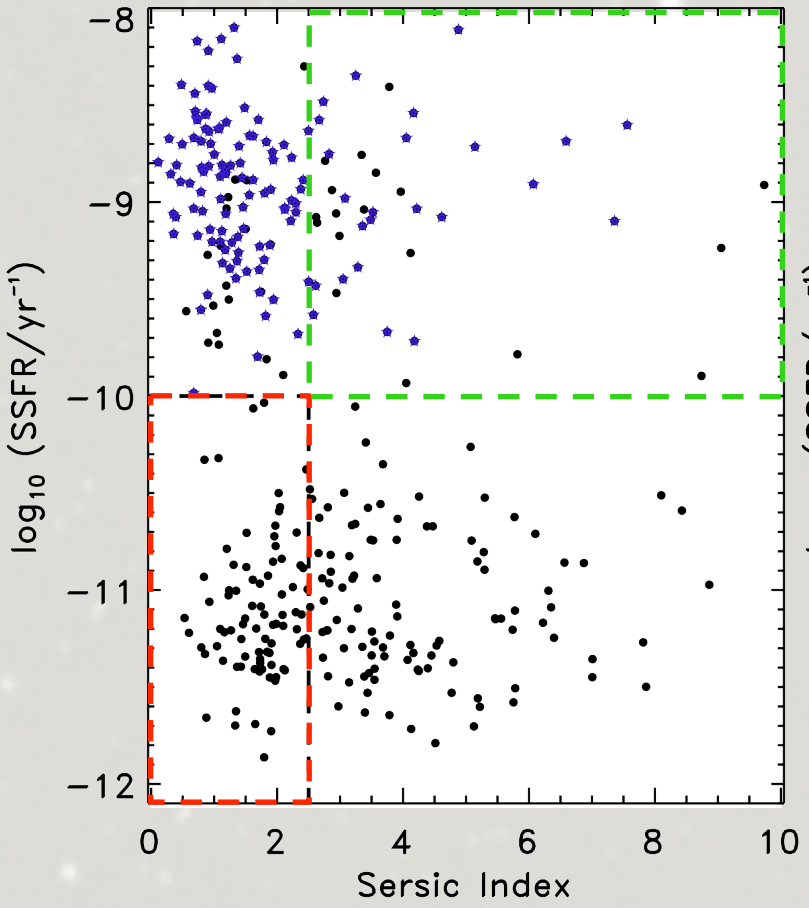


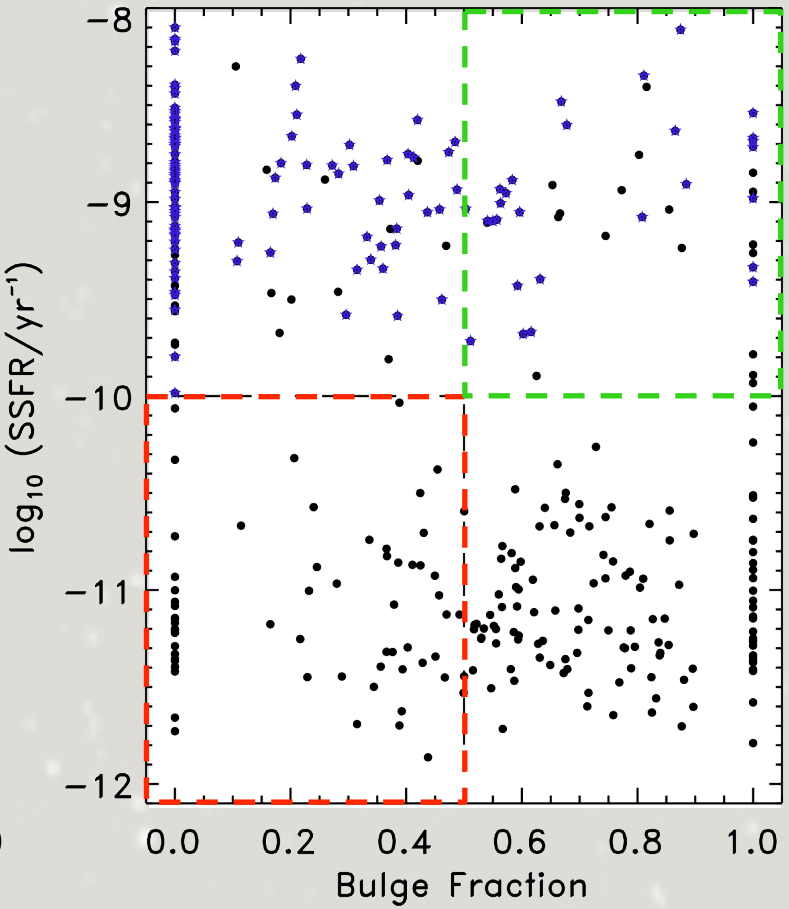


Morphology and Star-formation Rates

30±5%

29±5%





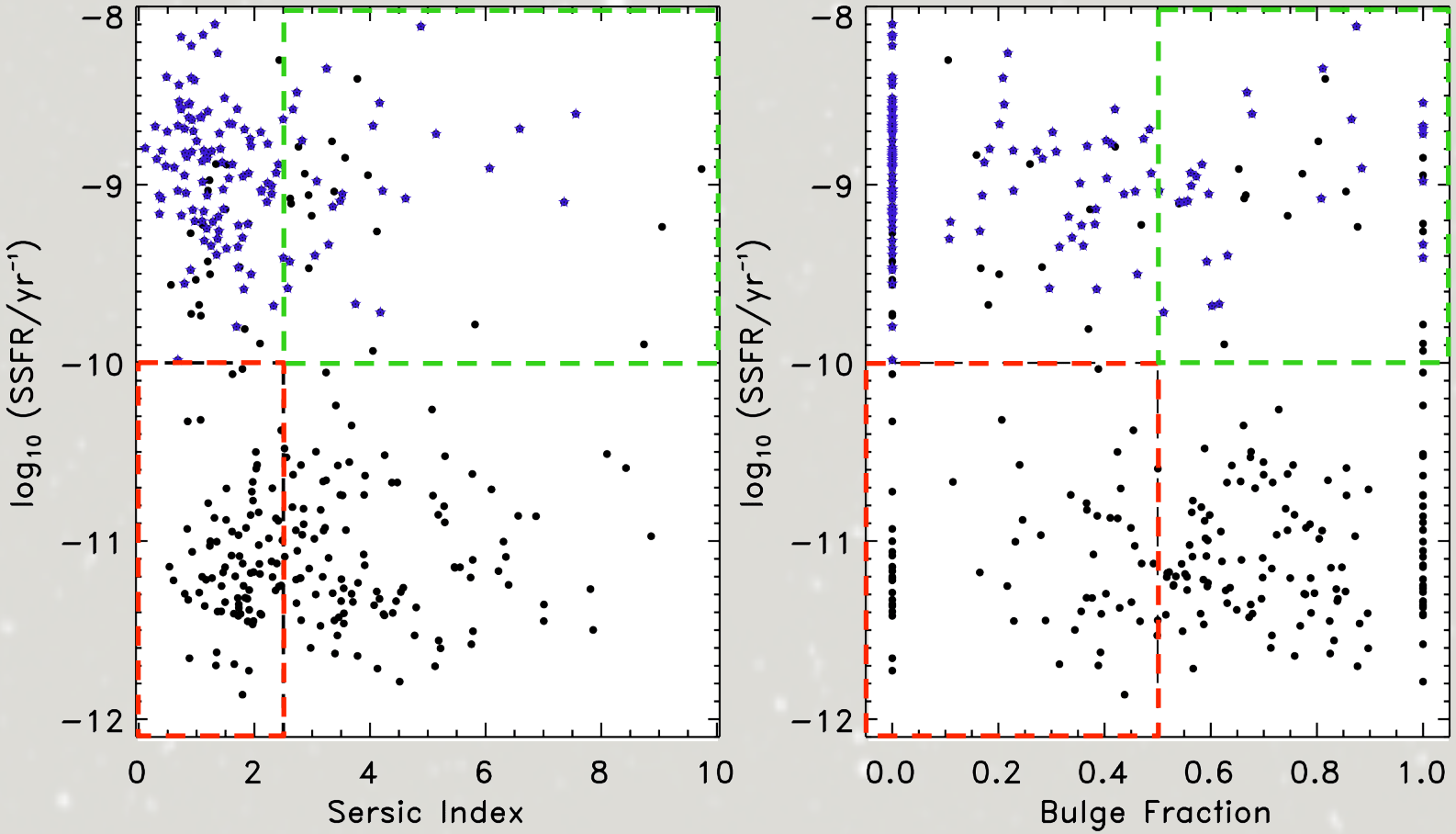
41±5%

33±5%

Morphology and Individual Star-formation Rates

30±5%

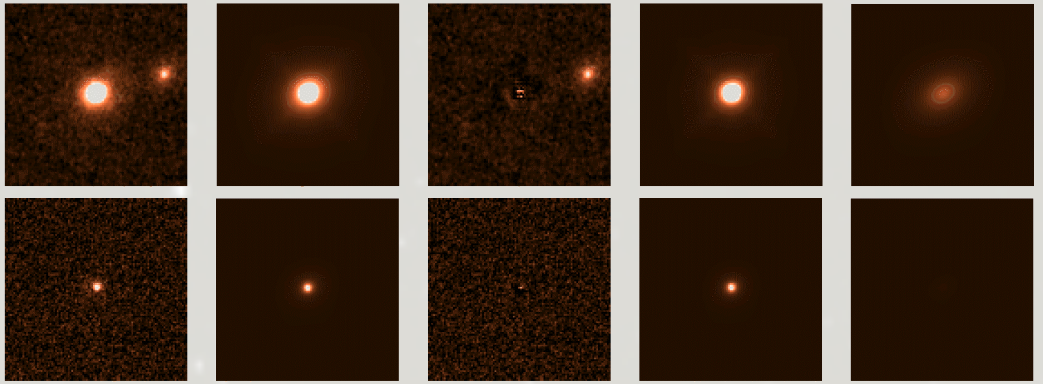
~~29±5%~~ 11±4%

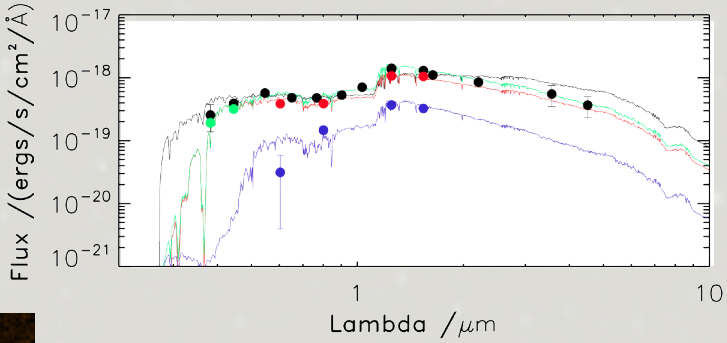


41±5%

~~33±5%~~ 18±5%

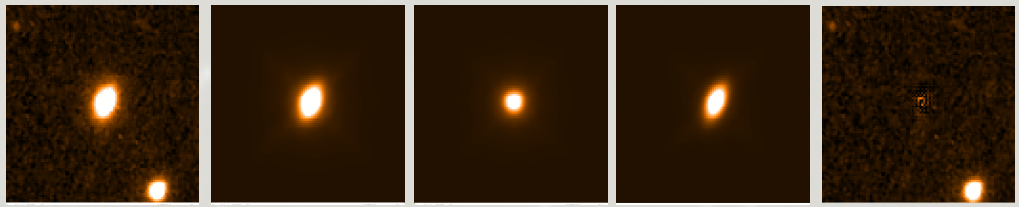
Star-forming Bulges

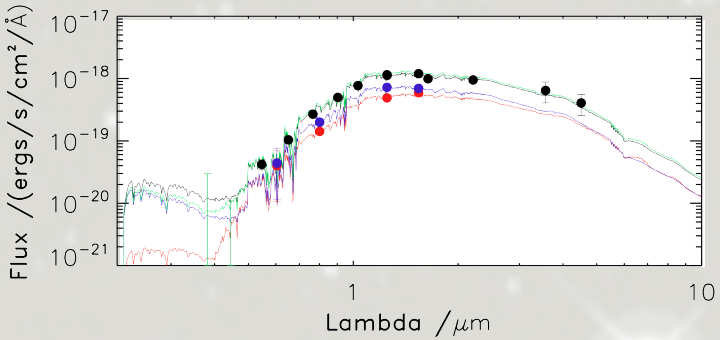




18±5%

Passive Disks

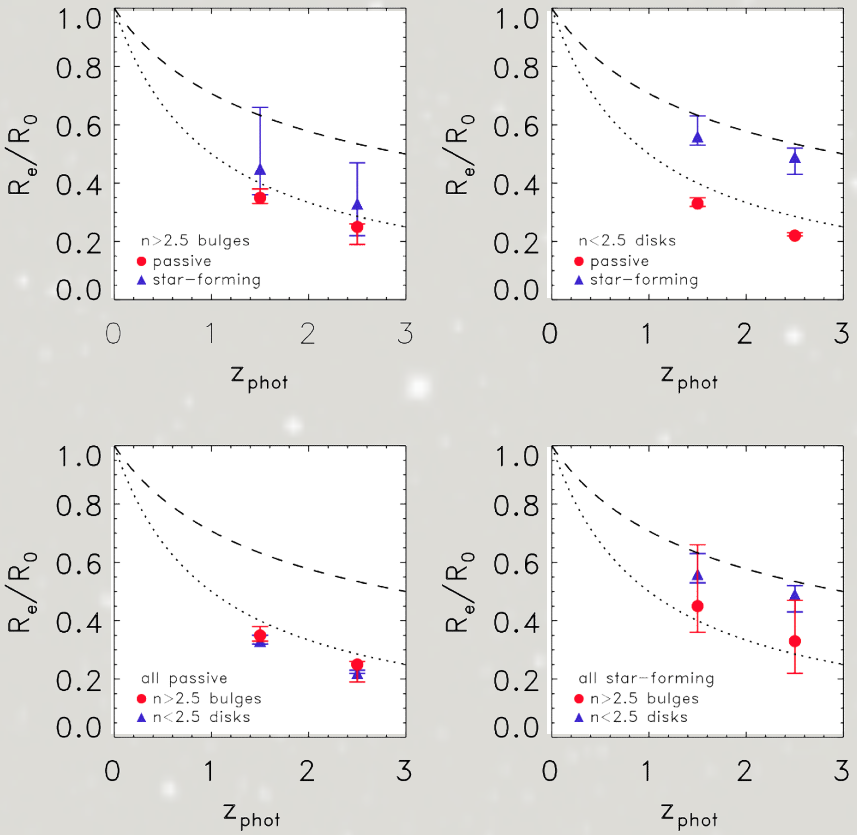




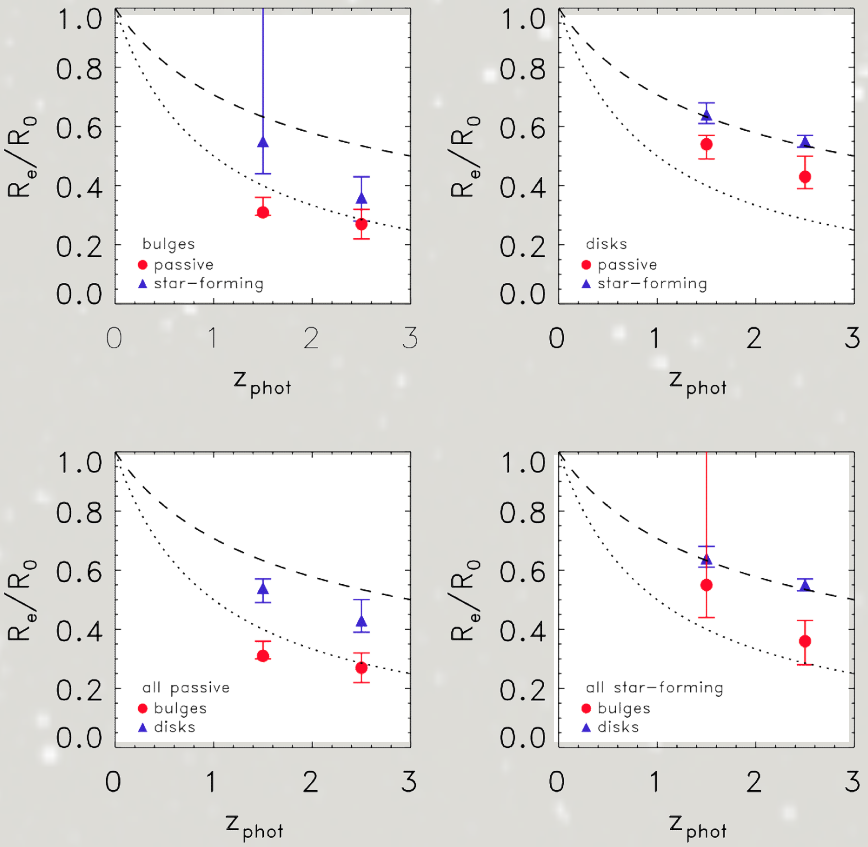
11±4%

Size Evolution

single Sérsic fits using n=2.5



all bulge and disk components

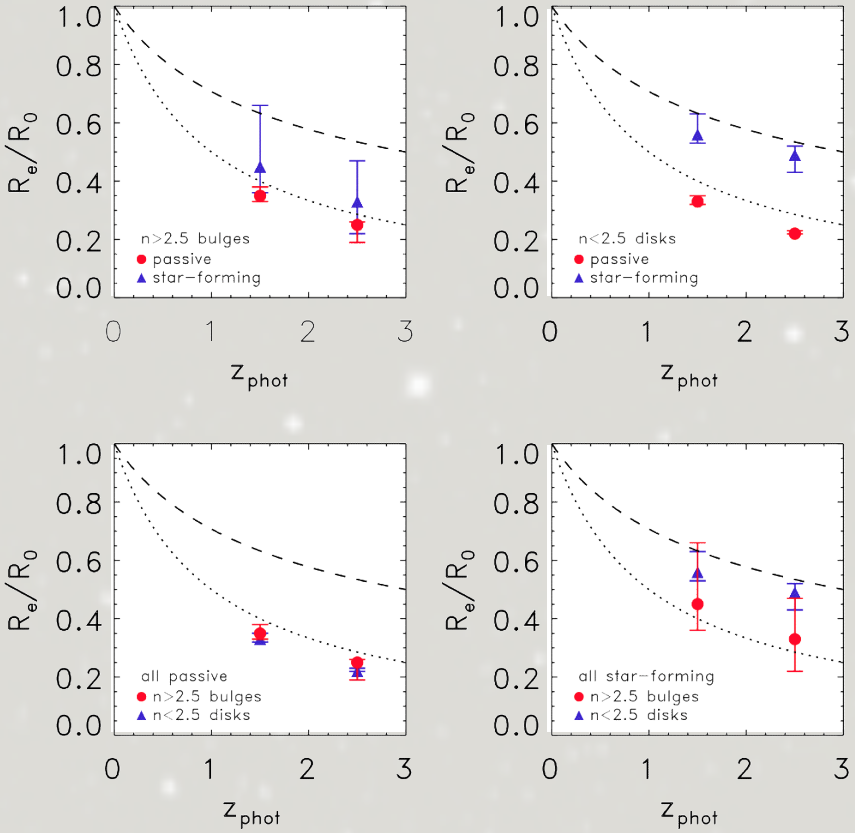


..... $R_e(z)/R_0 \propto (1+z)^{-1}$ for ETG's (van der Wel et al. 2008)

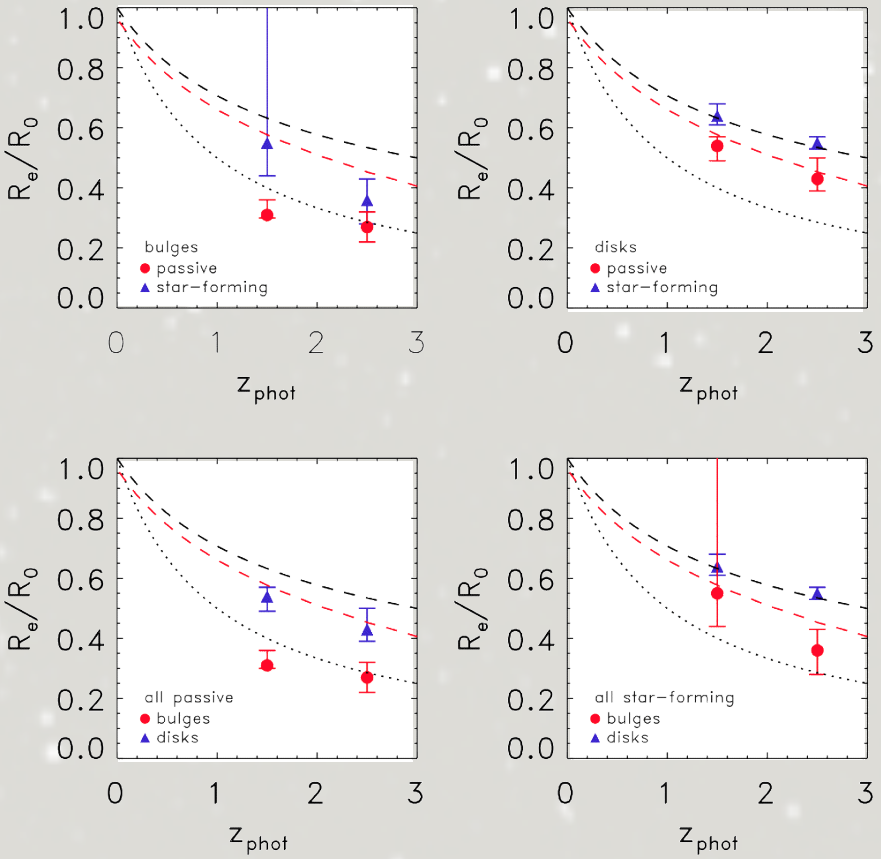
– – – - $R_e(z)/R_0 \propto (1+z)^{-0.5}$ for star-forming disks

Size Evolution

single Sérsic fits using n=2.5



all bulge and disk components



..... $R_e(z)/R_0 \propto (1+z)^{-1}$ for ETG's (van der Wel et al. 2008)

– – – - $R_e(z)/R_0 \propto (1+z)^{-0.5}$ for star-forming disks

– – – – 1Gyr earlier star-forming disk relation for the progenitors of passive disks

Conclusions

- $M_{\star}>10^{11}M_{\odot}$ galaxies are more disk-dominated above z=2, and below this become an increasing mix of bulges plus disks with decreasing redshift.

- Pure bulges are yet to emerge by z=1.

  ➡ Therefore $1<z<3$ marks the era of the rise of S0 galaxies.

- 18±5% of passive galaxies are disk-dominated and 11±4% of star-forming galaxies are bulge-dominated.

  ➡ Star-formation quenching is not simply connected to morphological transformations.

- Passive disks have intermediate sizes which are larger than passive and star-forming bulges but smaller than star-forming disks.

  ➡ Passive and star-forming disks have sizes consistent with a secular evolution scenario.

Bruce et al. 2014 a+b, in prep